PROCEEDINGS

OF THE

BIOLOGICAL DEPARTMENT

OF THE

ACADEMY OF NATURAL SCIENCES

OF PHILADELPHIA.

1860.

Reported by WALTER F. ATLEE, Recorder.

Dr. JOSEPH LEIDY, Director.

January.

I.—PATHOLOGY.

Dr. J. J. Woodward read a paper entitled, "*Remarks on Errors in the Anatomical Diagnosis of Cancer.*"*

II.—CHEMISTRY AND TOXICOLOGY.

1. Dr. Mitchell stated that lately in examining, in conjunction with Dr. Hammond, the chemistry of corroval and vao, they had succeeded in obtaining, in a crystalline form, *corrovaline*. It is formed by evaporation, from the solution in chloroform; one grain of corrovaline thus prepared was dissolved in one hundred grains of water, and one drop from the solution was sufficient to kill a mouse. The same quantity, in ten minutes, killed a frog.

2. Mr. Powel stated that when very young, in the laboratory of his uncle, Dr. Robert Hare, he had witnessed some very extraordinary poisonous qualities exhibited by the residue of the sweet oil of wine, distilled with some turpentine. The smell of this was sufficient to produce dizziness aud lethargic symptoms.

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*See American Journal of the Medical Sciences, for April, 1860.

February.

I.—ANATOMY.

Dr. Schmidt read the following paper upon a "*Method of Painting moist Anatomical Preparations.*"

Method of Painting Moist Anatomical Preparations.

BY H. D. SCHMIDT, M. D.

It is more due to neglect than any other motive, that I have not published, before this, the useful process of painting anatomical preparations, intended to be suspended in alcohol. The latter, as is known to every anatomist, affects the color of the different components of an organ, and thus renders them almost alike in appearance. This is a great disadvantage, as the object of such a preparation, is to show the relationship of the various parts of an organ, or that of different organs themselves. For instance, if the larger bloodvessels and ducts of a liver or kidney, &c., are injected and carefully dissected out, to exhibit their relative course, such a preparation will be of comparatively little value, if these vessels can not be readily distinguished from each other. This can only be accomplished by painting them with different colors. In dried preparations, this is easily done by coloring with oil-paint, commonly used by artists. But as the tissues of such preparations lose entirely their form by shrinking, they are rendered to a great extent unfit for study. It is different however, in the case of preparations intended to be preserved in a moist condition by suspension in alcohol. Here, the anatomist often becomes discouraged, when he finds his best dissections losing in appearance by the injurious action of the alcohol on the color of the tissues. To counterbalance this disadvantage, I have used a vehicle, which, while it unites with the tissues and thus adheres to them, is not affected injuriously by the action of the alcohol, but on the contrary, rendered only more firm. The process is so simple, that it seems rather strange not to have been resorted to long ago. The principle used as a vehicle, is *albumen*, in the form of the white of egg; and this is almost the only substance which will unite with the tissues, (as a great part of the latter consists of it,) without being injuriously affected by the alcohol. The colors used, of course must be mineral, and thoroughly ground with the albumen, on a plate of glass. After the preparation is painted, it is put into strong alcohol, which, to coagulate the albumen still more firmly, may be warmed. Not only the blood-vessels, ducts and nerves, may thus be beautifully colored, but with some artistical skill the color of the parenchyma of the organ may also be nicely imitated.

In the Anatomical Museum of the University of Pennsylvania, a liver with the blood-vessels and ducts carefully dissected, and painted with different colors by the above described process, can be seen suspended in alcohol. Likewise a kidney and a spleen; the color of the fresh parenchyma of the former is also imitated. These preparations I made three years ago, and up to the present time not the slightest change in the colors can be perceived; although they have often been carried to and from the lecture room. Another preparation, exhibiting the smaller muscles of the larynx, which are painted red, can also be seen. Intricate dissections of various regions can be made, the muscles, vessels, nerves, &c., colored, and their *form preserved* by the suspension in alcohol.

In connection with this subject, Dr. Leidy stated that he is in the habit of suspending injected preparations in turpentine, by which liquid the tissues are rendered translucent. The jars in which they are thus suspended, are hermetically sealed by means of a piece of hog's bladder, well soaked and dipped in a cement of gum arabic, acetic acid and sugar In order to suspend the preparation, a piece of whalebone or a bar of metal should be used; wood is too porous. Thus arranged the turpentine remains perfectly limpid.

Dr. Leidy added, that in these preparations, some change must take place in the air over the turpentine, for the bladder covering the jar bellies down, becoming concave. To give therefore a neater appearance to the preparation, he is in the habit of applying a second piece of bladder, prepared as the other; in which a small orifice is made with a pin, which prevents its retraction into the neck of the jar.

Mr. Slack stated that in England, glycerin was extensively used for mounting preparations, the high price of alcohol in that country preventing its general use for such a purpose.

II.—Pathology.

Dr. Leidy exhibited a portion of the stomach of a horse recently dead, which contained a number of spheroidal tumors, about an inch in diameter, The tumors contained a number of nematoid worms (*Spiroptera megastoma*) still alive.

Dr. Darrach, who had examined the structure of these tumors, had found their walls to be principally fibrous tissue, containing a puruloid matter filled with fine granules, which were the eggs of the worm. These tumors possessed orifices communicating with the stomach.

This horse was said to have died from *rupture* of the *diaphragm* caused by great distension of the intestines, in consequence of a large meal of Indian Corn. This rupture was situated in the muscular portion of the diaphragm, and was about six inches in length.

III.—Teratology.

Dr. Morris related a case of *arrest of development* in the hand of a young man with whom he is acquainted. This arrest is in two of his fingers. This condition of things is attributed by Dr. Morris to the action of filaments thrown around the fingers, and checking their growth, probably about the third or fourth month of intra-uterine life. These filaments or ligatures were assigned first by Dr. Montgomery as a cause of this phenomenon.

Dr. Mitchell while acknowledging, as a general rule, the justice of the reason assigned by Dr. Morris, for these arrests of development, declared that it could not explain those cases where for a series of generations the same deformity exists.

The mother of the person alluded to here, attributed the condition of her son's hand to her having witnessed the amputation by a surgeon of the same fingers while pregnant.

April.

Dr. Mitchell read the following paper on Corroval and Vao.

On the Physical and Chemical characteristics of Corroval and Vao, two recently discovered varieties of Woorara, and on a new Alkaloid constituting their active principle.

BY WILLIAM A. HAMMOND, M. D.

Assistant Surgeon U. S. Army, and

S. WEIR MITCHELL, M. D.

Lecturer on Physiology in the Philadelphia Medical Association.

The two new varieties of woorara, which, so far as relates to their physical and chemical characteristics, we design considering at present, were brought in February, 1857, from the Rio Darien, in New Granada, by Drs. Ruschenberger and Caldwell of the United States Navy. By these gentlemen they were presented to Prof. Joseph Carson, of the University of Pennsylvania, to whom we must express our acknowledgments for the opportunity afforded us of analyzing and experimenting with these curious poisons.

The corroval, the more powerful of the two, has the general appearance of a vegetable extract of a brownish black color. The fracture is somewhat conchoidal, but some of the fragments in our possession have a surface such as would be given to the superficies of an inspissated vegetable infusion on cooling. When pulverized, it is of a tawny yellow appearance. Its taste is an intense and very persistent bitter. The saturated aqueous infusion is of a very dark brown, almost black color, and of neutral or exceedingly slight acid reaction. The alcoholic tincture is of a pale yellow tint. Both water and alcohol extract the poisonous principle, as do also ether and chloroform, though to a very diminished extent. No crystals are deposited from either of these solutions, except from the ethereal. They consist entirely of fatty substances.

The residue, insoluble in water, submitted to microscopical examination, is seen to consist of vegetable cells, starch granules, portions of woody tissues, oil globules, &c.; small grains of silica are also to be observed. No parts of animals of any kind can be discovered by most careful examination with object-glasses of high power and excellent defining quality. If the fangs of poisonous serpents, the livers and other parts of the body were used in the manufacture of corroval, we should undoubtedly have detected their anatomical elements. We therefore regard it as certain that such substances do not enter into the composition of the material under consideration.

Corroval burns with a yellow flame, and gives off a considerable amount of smoke and vapor. This latter has an odor very similar to that of human excrement, and, as we have ascertained, possesses all the poisonous activity of the corroval in substance. A mouse made to inhale the fumes died in less than two minutes. Corroval heated upon platinum foil, in the flame of the blow-pipe, is almost entirely volatilized. The ash consists of silica, iron, and certain saline substances.

In external characteristics vao cannot be distinguished from corroval. That in our possession is a dark brown extract, hard, and perfectly dry, and unaffected by exposure to the atmosphere. It yields its toxic principle to water and alcohol, the infusions being of similar physical qualities and reaction with those of corroval. The insoluble portion

consists of a white or light gray deposit of a shred-like and flocculent appearance. Examined under the microscope this is seen to be principally composed of amorphous matter with which, however, starch granules and cells of vegetable origin, together with masses of woody tissue and fragments of silica are mingled. No animal structures are to be detected on the most minute examination.

Vao subjected to the action of heat acts in a manner not distinguishable from that of corroval, giving off a vapor with similar odor and other properties to that derived from the latter substance.

Woorara, of which corroval and vao may with propriety be considered as constituting species, has been analyzed by Roulin and Boussingault.* Pelletier and Petroz† and Heintz.‡

Roulin and Boussingault experimented with woorara which had been obtained from the Rio Negro. It was a solid extract of a black color, but brown when reduced to powder, of a resinous appearance, and exceedingly bitter taste. It burned with difficulty, and gave off no odor of organic nitrogenous substances. It was soluble in water, alcohol and in sulphuric ether, though not to any considerable extent. The aqueous infusion was of slight acid reaction; no strychnine was discovered by these chemists in woorara.

We may here state that two specimens of ordinary woorara, which we owe to the kindness of Major LeConte, of Philadelphia, and Prof. J. C. Dalton, of New York, agree in all essential particulars with that above described.

By the following process, Roulin and Boussingault obtained from woorara a new principle of an alkaloidal character, which they called curarin.

The woorara was reduced to fine powder and treated repeatedly with boiling alcohol. The extract thus obtained was evaporated, and the solid residue treated with water, which dissolved the active principle, leaving nothing but a little resinous matter. The aqueous solution was then decolorized by animal charcoal, and treated with infusion of galls. A beautiful whitish-yellow, flaky precipitate was then thrown down, having an exceedingly bitter taste. The supernatant liquid was almost entirely deprived of its bitterness; the precipitate thus obtained was well washed, heated to ebullition in water, and dissolved by the addition of oxalic acid. The acid liquor was then supersaturated by magnesia and filtered. It was again evaporated to dryness, and the residue dissolved in alcohol. This solution was concentrated and spontaneously evaporated to a syrupy consistence. It was subsequently further concentrated by evaporation *in vacuo*.

The analysis of Pelletier and Petroz yielded a similar product. These chemists extracted the woorara with alcohol, and treated the tincture thus obtained with ether, in order to remove the fatty and resinous substances present. The alcoholic extract was then evaporated, dissolved in water, and foreign matters precipitated from the solution by the acetate of lead, the excess of lead being removed by sulphuretted hydrogen. The solution was then decolorized by animal charcoal, filtered and evaporated; sul-

* Examen Chimique du Curare, Poison des Indiens de l'Orinoque, Annales de Chimie et de Physique, Tome xxxix, 1828, p. 24.

† Examen Chimique de Curare, Annales de Chimie et de Physique, Tome xl, 1829, p. 213.

‡ Reisen in British Guiana, Von Richard Schomburgk, Band i, S. 452, (note)

phuric acid diluted with absolute alcohol was then added for the purpose of draining off the acetic acid. The alcohol was removed by evaporation, and the sulphuric acid precipitated by baryta. The excess of the latter was separated by carbonic acid, the liquid was next filtered and concentrated in the water bath, and the curarin thus obtained further dried *in vacuo*.

Obtained by either of these processes, curarin is a solid transparent resinoid substance, of a pale yellow color, very hygroscopic and soluble to almost any extent in water and alcohol. Its taste is exceedingly bitter. The solution in water restores the blue color to reddened litmus paper, neutralizes acids, and forms salts with them, easily soluble in water, but uncrystallizable.

Curarin gives with concentrated nitric acid, a blood red color, and with concentrated sulphuric acid a carmine tint.

Heintz proceeded as follows:—To the aqueous solution of the woorara, tannic acid was added, and an abundant precipitate soluble in boiling water was obtained. This was taken from the filter, boiled with magnesia, and then evaporated to dryness. The extract thus obtained was then treated with alcohol, to remove it from any insoluble salts of magnesia, and the solution again evaporated to dryness. By this means a yellowish brown extract was obtained, possessing no alkaline reaction, but endowed in a eminent degree with the toxic principle of the woorara. Heintz does not regard this extract as at all pure; subsequently he employed both the bichlorides of mercury and platinum, to effect the precipitation, but with no better success, a yellowish extract being still obtained.

Heintz ascertained by Lassaigne's method that the extract contained nitrogen; he also found sugar, gum, resin, extractive matter and tannic and gallic acids; traces of saline combinations with organic acids, probably the tartaric and oxalic were also detected. He was unable to discern the least trace of strychnia.

We think it highly probable, that the woorara examined by Heintz was very far from being of identical character with that analysed by Roulin and Boussingault and Pelletier and Petroz. The difference in the process employed is not sufficient to account for the very dissimilar product obtained by Heintz. His method was certainly such as to have separated any alkaloidal principle present. The substance he did obtain was probably nothing but a purified and more highly concentrated woorara, deprived of its woody fibre, starch, silica, &c.

We now proceed to detail the several steps in a qualitative analysis, made of the corroval and vao.

A few grains of corroval were subjected to the action of ether. From the solution thus obtained, oil-globules were deposited on evaporation, together with a number of minute acicular crystals, insoluble in water, but completely dissolved by hot alcohol and ether. Globular masses of a supposed resin were also present.

To another portion, water was added till it was completely extracted of all its bitter principle. The residue was perceived to contain several masses apparently of a fatty character. On subjecting this substance to the action of hot ether, it was entirely dissolved, and on evaporating the solution from a slip of glass, and viewing the residue with the microscope, numerous delicate acicular crystals collected in groups and radiating from a central nucleus were perceived. These were soluble in hot alcohol. The remaining portion was in the form of oil-globules.

After thus separating the fatty substances as above, the portion insoluble in water was placed in a small retort with a little water; a receiver surrounded with ice was luted to the retort, and heat applied to the latter. On the surface of the distillate a small portion of essential oil floated. This had an odor somewhat resembling that of mustard, but much less pungent.

The substance remaining in the retort was next dried at a low temperature, and subjected to the action of alcohol. A yellowish-brown solution resulted, from which, on evaporation, a resinoid substance was obtained, having an odor very similar to that of a true essential oil.

The residue was next calcined in a platinum crucible. By this process the woody fibre, &c., was consumed, hydrochloric acid was added to the ash, and the silica thus separated. To a portion of this solution in hydrochloric acid diluted with water, ferrocyanide of potassium was added, and distinct evidence of the presence of iron obtained. Another portion treated with bichloride of platinum gave after a lapse of several hours a reddish crystalline precipitate, indicating the presence of soda.

We were prevented by an accident continuing the analysis of the above portion.

The aqueous solution was found by the addition of gelatin in excess, to yield a flaky, yellowish white precipitate of tannate of gelatine. It was filtered, and to the filtrate perchloride of iron added. A black precipitate of gallate of iron was thrown down.

From the foregoing analysis we conceive that we have ascertained the existencee in corroval, besides, the active principle, of the following substances:—Olein, Margarin, Essential Oil, Resin, Starch, Silica, Iron, Soda, Woody Fibre, Tannic Acid, Gallic Acid.

The small quantity of corroval in our possession, prevented us from extending our analysis further in this direction, and for the same reason we are the less disposed to insist upon the absolute accuracy in all its steps of the foregoing investigation. Several of the above named substances were detected by the microscope alone, and this instrument was constantly employed throughout the whole analysis.

In the separation of the active principle of the corroval, we made use of the following processes:

1st. Ten grains of the substance were extracted by repeated portions of boiling water, till a bitter taste was no longer afforded. The solutions were now mixed and boiled with magnesia. It was next filtered, and the filtrate filtered repeatedly through animal charcoal, till all the bitterness and coloring matter were entirely absorbed. The charcoal was then treated with boiling alcohol in fresh portions till all bitterness was extracted from it. The alcohol was then evaporated to dryness. By this means a very bitter substance of a greenish white color was obtained, possessed in a high degree of the toxic properties of the corroval.

2d. The process employed in this instance was that first used by Roulin and Boussingault, but modified by employing water to extract with, instead of alcohol.

Ten grains of the corroval were reduced to fine powder and extracted with water, as in the first described process. To the solution, tannic acid was added in excess, a voluminous flaky precipitate of a yellowish-white color was thrown down. This was well washed on a filter to remove the tannic acid, mixed with water and heated to boiling, a few crystals of oxalic acid being added till it was entirely dissolved. The acid liquor was next treated with magnesia, in excess, and filtered. The filtrate was

evaporated to dryness, and the extract thus obtained, dissolved in hot alcohol. This solution, evaporated to dryness, furnished a substance similar to that obtained by the first process, but more highly colored.

For the principle thus obtained, possessing as it does the properties of an alkaloid, and in a high degree the toxic properties of the corroval, we propose, in accordance with the principles of the United States Pharmacopœia, the name of *corrovalia*.

Corrovalia* is, when pure a greenish-white substance, of low specific gravity, and, upon the whole, similar to tannic acid in general appearance. It is soluble in alcohol, ether and chloroform, and, contrary to the statement in our original memoirs, to a slight extent in water. Heated upon platinum foil, in the flame of a spirit-lamp, it is entirely volatilized. With concentrated nitric acid it gives an emerald green color, which deepens in tint if a small piece of bichlorate of potassa be added. With sulphuric acid, a reddish-brown color is formed, which, with the further addition of bichromate of potassa, changes in a few minutes to a deep olive green ; with ammonia it gives a deep yellow color, but no precipitate ; with potassa in solution, the result is much the same ; with tannic acid, it gave a white precipitate.

With iodide of potassium in solution, corrovalia yielded no precipitate or change of tint, nor did it give rise to any reaction in the presence of bichloride of platinum.

Corrovalia is uncrystallizable from all its solutions, except from that in chloroform. A drop of the chloroformic solution evaporated to dryness on a slip of glass, and subjected to microscopic examination, exhibits numerous acicular crystals, mostly collected in groups, and radiating from common centres.

Corrovalia neutralizes the sulphuric chlorhydric and acetic acids, and in all probability others, the quantity in our possession being too small for us to investigate its properties further in this direction. The salts formed with the above mentioned acids, as far as we have been able to ascertain, are uncrystallizable.

Introduced into the blood, corrovalia exerts a toxic power, equalled by few if any substances hitherto known to man. A grain was dissolved in one hundred minims of water. One minim of this solution killed a small mouse in five minutes, when inserted under the skin, and five minims in four and a half minutes produced the same result in a medium sized rabbit. With frogs it is especially active.

The amount of alkaloid obtained by us from corroval ; amounted to about ten per cent.; from vao, the proportion did not exceed four or five per cent.

Vao is therefore much weaker than corroval, its physiological action is very similar to the latter substance. The amount of resin contained in it is considerably greater than that found in the corroval, as is also the woody fibre. For the physiological effects produced by these new and curious poisons, we must refer to the memoir to which we have already alluded.

Owing to the small quantity of these substances in our possessiou, we have been unable to make an ultimate analysis of them, and consequently cannot at present give formulas of their composition. In other respects we have from the same cause been unable to carry our investigations as

*Experimental researches relative to Corroval and Vao, &c., American Journal of the Medical Sciences, No. lxxv, N. S., July, 1859.

far as we desired. We therefore hesitated to publish the results of our examination of the chemical nature of these poisons, but upon more mature reflection have concluded to lay them before the scientific world, trusting at some future period to be enabled to present a more complete memoir on the subject, and to correct any errors into which we may have fallen in the course of the researches just concluded.*

May.

1.—PHYSIOLOGY.

A paper was read, entitled, "*Food of the Shad of the Atlantic Coast of the United States, (Alosa sapidissima,) and the functions of the pyloric cæca.* By E. R. Mordecai, M. D., of Mobile, Alabama.

This paper, after calling to mind the anatomy of the alimentary canal of the shad, lays particular stress upon the facts that the teeth are very small, and of such an arrangement as to suggest its food to be easy of prehension; that the largest, longest, and also the greatest number of the cæca open into the *inferior* wall of the expansion of the intestine that is found beyond the pylorus.

On examining the intestines of a number of shad, fresh run from the sea, the cæca were always found to be distended by a brownish-looking fluid substance, not differing to the naked eye from a fluid material of the same color, filling the stomach. This fluid under the microscope, both that from the stomach and from the cæca, was seen to be composed of differently shaped and colored fragments of algæ and the calcareous shields of infusoria.

The food of the shad would therefore appear to be marine algæ, which are broken down by the powerful muscular walls of the stomach, aided by the broken shells of infusoria. The cæca are receptacles for food; enabling the animal to exist for a considerable time without receiving additional nourishment.

Arguments in favor of these views are drawn by Dr. Mordecai from an analogous condition of things in other fish, that ascend fresh water streams, or seek other places than those likely to supply them with food, for the purpose of spawning.

Specimens mounted for microscopical examination accompanied this paper; and the statements above made in regard to the contents of the stomach and the cæca, were abundantly verified by members of the Academy.

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*Some misconception appears to have been occasioned by the names under which we have studied these poisons. In our first essay they were distinguished as "corroval and vao, two new varieties of woorara, the South American arrow poison." In consequence of this title, it has been supposed that we regarded corroval and vao as identical with the woorara of De-la-Condamine, Kolliker and others. No person, however, who went beyond the title of the papers, could possibly entertain this idea, since the toxicological distinction is drawn in the most definite manner. All the specimens of corroval and vao which we have seen, have come to us labelled *woorara*, and we have been informed that this term, or the more specific appellation, were indiscriminately used by the Indians of the Rio Darien.